1 (a) $\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1}+\frac{\hat{p}_2\hat{q}_2}{n_2}} = 0.01878$

$\hat{p}_M = \frac{315}{1150} = 0.2739$

$\hat{p}_F = \frac{235}{1000} = 0.235$

(b) $\hat{p} = \frac{X_1 + X_2}{n_1 + n_2} = \frac{315+235}{1150+1000} = 0.2558$

(c) $\sqrt{\frac{\hat{p}\hat{q}}{n_1}+\frac{\hat{p}\hat{q}}{n_2}} = 0.01886$

(d) 1 $H_0: p_M = p_F$

$H_a: p_M > p_F$

2 Conditions

1 2 indep. SRS

2 $n_1\hat{p}_1$, $n_1\hat{q}_1$, $n_2\hat{p}_2$, $n_2\hat{q}_2$ ≥ 10

3 $pop_1 \geq 10n_1$, $pop_2 \geq 10n_2$

1 stated indep & random

2 315, 835, 235, 765 ≥ 10 ✓

3 there are more than 11500 men and 10000 women ✓

Conditions met, normal, 2 prop Z-test

3 $z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}\hat{q}}{n_1}+\frac{\hat{p}\hat{q}}{n_2}}} = 2.0626$

$P(Z > 2.0626) = 0.0196$

4 - We reject Ho b/c p-value of 0.0196 is less than $\alpha = 0.05$.

- We have sufficient evidence that the true % of men and women who are colorblind is equal

(e) Given that (or assuming) the percent of men and women who are color blind is equal, we have a 1.96% chance of getting our sample or something more extreme

(f) Saying that the % of colorblind men is greater than the % of colorblind women, when really they are the same

P(Type I) = $\alpha = 0.05$

(g) Saying that the % of colorblind men is = to women, when really they aren't.

(h) saying that the % of color blind men is greater than women, and it is.

(i) P(Type II) = 1 - power = 15%

(j) Conditions met in part (c). Normal. 2 prop Z-Interv

$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}} = (0.0021, 0.07572)$$

We are 95% confident that the difference between the true % of men & women who are colorblind is btw. 0.21% and 7.572%

② significant = reject Ho

* p-value = 0.06

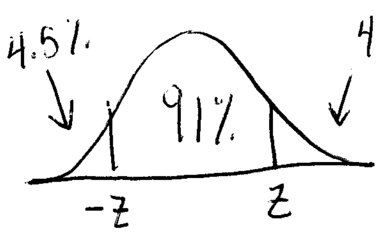
@ 5% level → no, not significant (fail to reject Ho)

@ 1% level → no, " " "

@ 10% level → yes, significant (reject Ho)

---

③



$-z = \text{invnorm}(0.045, 0, 1)$

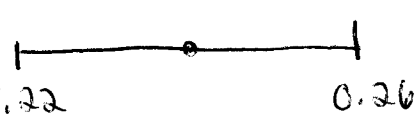
$-z = -1.6954$

$z = 1.6954$

---

④ ↑ confidence ⇒ wider interval

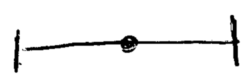
92%



Answer: B

94%

⑤ 90% (narrower)



Answer: C

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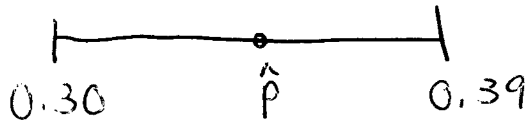
⑥



ⓐ $\hat{p} = 0.345$

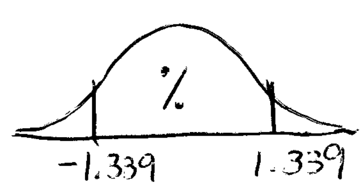
$m = 0.045$

ⓑ $m = z^* \sqrt{\frac{\hat{p}\hat{q}}{n}}$

$0.045 = z^* \sqrt{\frac{(0.345)(0.655)}{200}}$

$z^* = 1.339$

Conf = 81.94%



normalcdf(-1.339, 1.339, 0, 1) = 0.8194

7 $m = 0.06$

Conf = 99% $\Rightarrow z^* = 2.576$

$n = ?$

$\hat{p} = 0.86$

$$m = z^* \sqrt{\hat{p}\hat{q}/n}$$

$$0.06 = 2.576 \sqrt{\frac{(0.86)(0.14)}{n}}$$

$$n = 221.9298\ldots \Rightarrow 222$$

---

8 a

$p = 0.40$ Conf = 94%

$\hat{p} = 15/45$

Conditions

1. SRS — 1. stated
2. $n\hat{p}$, $n\hat{q} \geq 10$ — 2. 15, 30 ≥ 10 ✓
3. pop $\geq 10n$ — 3. there are more than 450 gas stations

conditions met.

normal model $\rightarrow$ 1 prop Z Interval

$$\hat{p} \pm z^* \sqrt{\hat{p}\hat{q}/n} =$$

$$(0.20116, 0.4655)$$

We are 94% confident that the true % of gas stations that ~~leak~~ have leaks is btw 20.116% and 46.55%.

b claim: 40%

No, we don't believe the % of stations w/ leaks has decreased (or changed) because 40% is in our interval.

c In repeated samplings of the same size (45), 94% of the intervals created would contain the true % of gas stations w/ leaks.

9 a $p = 0.42$ $\hat{p} = 76/200$

Ho: $p = 0.42$
Ha: $p < 0.42$

Conditions

① SRS ① stated

② np, $nq \geq 10$ ② 84, 116 ≥ 10 ✓

③ pop $\geq 10n$ ③ there are more than 2000 HS Students in PA

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = -1.1461$$

$$P(z < -1.1461) = 0.1259$$

- We fail to reject Ho b/c our p-value of $0.1259 > \alpha = 0.05$.
- We have sufficient evidence that the true % of Vit. C deficient HS students in PA is still 42%

conditions met → normal model → 1 prop z test

b Assuming there are 42% Vitamin C deficient HS students in PA, we had a 12.59% chance of getting our sample (or something more extreme).

c P(Type I) = $\alpha = 0.05$
Saying that there are less than 42% Vitamin C deficient HS students, when really there are not less

d Type II = saying there are still 42% Vit. C deficient when really there are less.

Power = Saying there are less than 42% Vit. C deficient, and there are less.

e ↓ significance level (α): Type I (α): ↓
Type II: ↑
Power: ↓